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# The Scientific and Administrative Principles underlying the State Control of Infectious Animal Diseases in Denmark*

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TO belong to a small nation is not always a handicap. It may have certain advantages, for example from the point of view of a veterinary administrator.

When I speak to colleagues from bigger countries about their work, I am very often reminded of those space-ships, which at some time in the future will float about in the heavens with remnants of the force of gravity as their only connexion with the earth. The contact of veterinary administration with practical life is made difficult—so at least it seems to me—in large countries compared with a country like mine.

We have in Denmark well over 3,000,000 head of cattle, distributed on about 180,000 farms, 4,800,000 pigs, 36,000 sheep, and so few goats that I ought to know them all by name. Looking through the files of the Veterinary Directorate it is possible to follow the results of the tuberculin tests in the individual herds during the last 15 to 20 years. In like manner we keep ourselves informed of the results of the compulsory milk-ring tests carried out quarterly on milk from all cattle herds in the country, and of all the examinations of blood samples demanded by the brucellosis eradication scheme. We are usually better informed of the results of tuberculin tests, milk and blood examinations than the owners of the herds themselves.

When a practising veterinary surgeon meets a case of a notifiable disease he must immediately inform the local chief constable (in case of foot-and-mouth disease the Veterinary Directorate too). The veterinary surgeon and the chief constable then decide which restrictions and which orders are to be enforced in connexion with the outbreak of disease—in accordance with the current instruction to the veterinary police when called upon to fight contagious diseases. From the chief constable the case is reported to the Veterinary Directorate with information of the decree given, so that the Veterinary Directorate may know all the measures taken. If there is anything to correct or add, the chief constable is asked to do it.

As will be seen, the Veterinary Directorate is in close contact with the individual herd, as it is also when combating the notifiable diseases. In another field, our administration may appear unnecessarily complicated.

The Veterinary Directorate does not have its own diagnostic laboratory—apart from a laboratory for poultry diseases. All diagnostic examinations made according to current laws are carried out at the State Veterinary Serum Laboratory or at the State Veterinary Institute for Virus Diseases, two institutes directly under the Ministry of Agriculture—and at the aforementioned poultry laboratory. Moreover, some of the laboratories at the Royal Veterinary and Agricultural High School carry out certain diagnostic examinations demanded by the Veterinary Directorate or according to agreement with the Veterinary Directorate—for example the investigations into *Vibrio fetus* infections of bulls.

You may think this a little mixed up. In practice, however, the arrangement functions remarkably well. The Veterinary Directorate has never felt the lack of a laboratory as there has always been excellent co-operation with the chiefs of the different laboratories. When new tasks had to be taken on, they always most obligingly put the results of their research at the disposal of the Veterinary Directorate.

The Veterinary Directorate comes under the Ministry of Agriculture. Besides the Veterinary

* This, and the paper following, were read to the Association of Veterinary Teachers and Research Workers at their meeting in Liverpool on April 10th, 1956.

Director the staff comprises 17 veterinary inspectors, nine assisting veterinary surgeons, and an office personnel of 70. Among other things we have a department for the veterinary control of meat, milk, and other foodstuffs of animal origin, and a department for the control of diseases of domestic animals.

Two veterinary inspectors, one on the Islands and one in Jutland, are concerned with the control of diseases in domestic animals. They take care of the notifiable diseases, of the supervision of markets, of the export and import of animals and animal products, and of the keeping and dispensing of medicine by the veterinary surgeons. Two other veterinary inspectors, one on the Islands and one in Jutland, are exclusively concerned with combating bovine tuberculosis and brucellosis.

When the fight against bovine tuberculosis began to develop it proved necessary to employ 16 district veterinary surgeons. To each one was assigned a district within which he had to spread propaganda and act as an adviser and supervisor in regard to the combating of tuberculosis (later on of brucellosis, too).

At first these district veterinary surgeons were only intended to act as assistants in the combating of tuberculosis and brucellosis. Gradually, however, more and more tasks have been allotted to them, for example that of combating of foot-and-mouth disease.

### Foot-and-Mouth Disease

We have to go back to the beginning of the century to find a year when Denmark was altogether free from outbreaks of foot-and-mouth disease, and since 1920 the number of outbreaks have varied between 3 in 1948, and 98,265 in 1926, when we suffered our largest epizootic.

When, a year ago, the European Foot-and-Mouth Disease Commission distributed questionnaires, one of the questions was about the origin of the epizootics in the different countries. All the countries answered that their epizootics had their origin in other countries, and the same holds true for Denmark. Our epizootics always occur in conjunction with an epizootic in Germany or Poland, and it is interesting to note that epizootics nearly always begin on some of our islands. The frontiers are only crossed at a later period. The distance between the south coasts of our southernmost islands and the north coast of Germany is not great—only about 20 kilometres between Fehmern and Lolland.

Over the years, we have tried to fight the foot-and-mouth disease epizootics by the stamping-out method, but the disease was always the stronger. Were Denmark an insular kingdom we might possibly have succeeded. However, as soon as the German frontier regions are infected, the intensity of infection from the south is so massive that we have to stop stamping-out measures. By the time of the 1937-8 epizootic, when the attempt was carried furthest, 617 herds comprising a total of 14,423 cattle and about 11,000 pigs were destroyed. Even if we assume that the destruction of all these animals has contributed towards the slowing down of the development of the epizootic, many herds seem to have been sacrificed in vain.

A foot-and-mouth disease epizootic is a disaster for a country, for the economy of the farmers as well as for the economy of the nation as a whole. Therefore, in 1938, the advent of a vaccine against this disease, a vaccine in which virus is adsorbed onto aluminium hydroxide, was received with great expectations.

We have counted on the use of this vaccine, too, in our veterinary police measures (*i.e.* isolation of disease-infected premises, regional restrictions on the transport of animals, etc.) in that we have ordered vaccination of all cattle within an infected area.

Our experiences of the use of vaccination against foot-and-mouth disease since 1938, and particularly during the epizootic 1951-2, can be expressed briefly in the following plans for our future fight against the disease.

The situation in West Germany will demand our greatest attention. Though the vaccine laboratories of West Germany have increased their capacity so much that they expect to be able to meet any situation, we must, however, take the possibility into account that an epizootic may still be experienced. Even if we endeavour always to have sufficient quantities of vaccine (or virus) in stock in Denmark, it is very important that the building up of an epizootic elsewhere is brought to our knowledge as early as possible. The international information service must therefore be functioning.

The capacity of our vaccine laboratory has been increased so much that its capacity is bigger than most other vaccine-producing laboratories. We are able to produce virus sufficient for the vaccination of about 150,000 animals every week. If necessary, in a threatening situation, we may change over to a vaccine with a lower content of virus, so that all herds in the country may be vaccinated quickly—even if the duration of immunity is shortened when the less-potent vaccine is used.

Provided that a possible epizootic in Germany does not start in the frontier regions, and that it is not caused by a type (a variant type) against which our stock of vaccine is useless or of but little effect, it should be possible to get the vaccine production started so early that vaccination on a large scale can be brought about at the same time as herds, which may have been infected already, are destroyed.

Most of the epizootics in Denmark have started south of the main road from Copenhagen to Esbjerg. Consequently, we have a prime interest in getting all cattle, about 1,000,000 animals, in this area vaccinated. We have authority to make such a vaccination compulsory. However, if we do, the exchequer will have to pay for the vaccination, and, after all, under the circumstances mentioned and with some stirring up of the mind of the public, vaccination on a voluntary basis is expected to cover the whole area sufficiently.

It is not easy to predict the future, neither is it easy to foretell how such a vaccination of the threatened areas is going to act. Will the pigs—which cannot be vaccinated—get infected within these areas? And can it be assumed that these mass vaccinations of cattle will ward off the epizootic and safeguard the cattle in other parts of the country?

Our experiences from the last epizootic do not answer these questions, because the vaccination was started too late. We had to be content to vaccinate in the wake of the epizootic instead of ahead of it.

In all probability some scattered outbreaks of foot-and-mouth disease will appear in pigs within the area where the cattle have been vaccinated, and also north of the Copenhagen-Esbjerg main road. In both instances slaughtering of the infected herds will, I think, have to be ordered. Vaccination in the surrounding district must be carried out, if it has not taken place already.

If, on the other hand, the epizootic should take us by surprise and spread violently, as was the case in 1951, it is most unlikely that slaughtering of the infected herds will be attempted. We should have a fair chance of stamping out air-borne infections from the German and Polish north coasts by slaughtering infected herds and vaccinating in the vicinity. When, however, the epizootic spreads in South Schleswig an attempt to prevent the propagation of the disease by slaughtering is hopeless, and when the epizootic has gained a foothold in the country the usefulness of the vaccine will be limited. We may be able to hinder the development of disease but will almost certainly be too late to stop it.

### Contagious Abortion

With foot-and-mouth disease one must always be prepared for the worst; it is, therefore, comforting to turn to the consideration of brucellosis of cattle. This disease is already well under control in Denmark, and we have reason to expect that in a short space of years total eradication will be achieved.

At the B.V.A. congress in Belfast last year I read a paper on "Brucellosis Control and Eradication in Denmark," so it is unnecessary for me to enter into details here, and I am just going to mention certain ruling principles of the work.

All cattle herds in the country are controlled quarterly by means of the milk ring test. The milk samples are taken from the individual buckets, when they arrive at the dairy. They are forwarded to the State Veterinary Serum Laboratory, or to a private laboratory approved by the Veterinary Directorate for this special purpose. If the milk from a herd does not react to this test, the quarterly sampling is continued until the herd has proved free from reactions by at least four consecutive tests. Two to six months after the last milk ring test, an examination of the blood of all animals over one year of age is carried out. If all animals pass this test, and if no vaccinations have been carried out during the examination period, the herd can be entered in the register of brucellosis-free herds. If, however, the herd does not pass the milk ring test, all animals over one year of age are blood-tested twice a year. If on the first of these examinations only a few reacting animals are detected, or if repeated examinations fail to show the appearance of new reactors, one is justified in supposing that the disease is present in an inactive form, and the sale of reactors may be encouraged. If, on the other hand, so many reactors are found that the sale of them is not a practical proposition, or if the disease is present in an active form, the reactors have to be isolated as well as possible in a separate group in the stable nearest the outlet of the dung channel. The area behind the animals is cleaned scrupulously, and daily disinfection with chloride of lime is carried out.

When a reacting animal is going to calve, or if it shows signs of aborting, it must be completely isolated from other animals from three to four days before, to 14 days after, calving or aborting. Non-reactors in the herd have also to be isolated if they show signs of aborting or of calving before term.

In our experience aborting animals excrete by far the greatest amount of contagious matter during the period mentioned—from three to four days before, to 14 days after, calving. Therefore it is very important to isolate the calving animals. The excretion of contagion in the shed is diminished, so that the vaccinated animals (in Denmark vaccination must be carried out when the animals are five to seven months old) may be subjected to this degree of infection without risk. Conversely, we have repeatedly seen that when the calving animals are not isolated, the immunity of those vaccinated is too weak to resist the greater degree of infection.

To complete the picture I should mention that, as a matter of course, aborted fetuses and placenta must be buried and the place in the stable where abortion or premature calving has taken place must be thoroughly disinfected.

I also want to stress that in herds where the disease is widely disseminated and abortions constantly occur, the sale of reactors must only be started when it is quite sure that the disease in the herd is in an inactive phase.

Our work in connexion with the fight against bovine brucellosis has been attended by not a few disappointments. I am thinking about the many herds infected or reinfected during the campaign. Up to 25 per cent. of our herds were infected when we started, and nearly the same number of herds became infected during the years of the fight—quite another situation from the one we know in the fight against tuberculosis.

Malta fever has never been diagnosed in Denmark, but since 1929 we have seen the start of several enzootics of porcine brucellosis. Fortunately, we were able to stop them every time before they spread to larger areas. We experienced the biggest spread of this disease in 1929-32, when 240 herds of pigs were found infected. In 1940 the disease was diagnosed in a single herd, and 14 herds were infected in 1951. A most remarkable fact in connexion with these outbreaks was that all of them occurred within the same locality in Jutland—an area in the eastern and middle parts of that peninsula, situated between the towns of Aarhus-Skanderborg-Viborg-Randers. In 1929-32 the enzootic also spread to Zealand with the transport of infected animals.

Why the same area in Jutland became infected again and again became the object of much speculation. It was only through Magnus Christiansen's investigations into the prevalence of disease in

wild game that we ultimately found the right track. By these investigations, which were carried out at the State Veterinary Serum Laboratory, brucellosis was demonstrated during the period 1951-4 in hares from the above area in East and Middle Jutland, and also from the island of Langeland and from a plantation in West Jutland, that is, in widely separated localities. When the results of these investigations came to the knowledge of the Veterinary Directorate, blood-samples were ordered to be forwarded for serological examination from all sows slaughtered at the bacon factories receiving pigs from those three districts.

Though the investigation covered nearly 30,000 sows, only one infected herd of pigs was found, namely on the island of Langeland in December, 1954. As no further reactions were detected, it may be taken for granted that no spreading of the infection took place, and the Veterinary Directorate discontinued these investigations. Instead, it has been made obligatory for the whole country to submit blood-samples for serological examination from all boars slaughtered at the bacon factories. Though several thousand blood-samples have already been examined, no positive reactions have been encountered, so there is every reason to believe that the enzootic was checked at the very outset.

How the contact between the infected hares and the pigs came about is demonstrated by the case of the infected herd on Langeland. The owner was an ardent hunter. He had shot a hare and threw the entrails to the pigs.

### Tuberculosis

When, in 1923, as a young graduate I went into practice, it was common to encounter tuberculous animals each day. It is, therefore, quite a remarkable fact, that in Denmark we have now several hundred young veterinarians who have never seen a tuberculous cow. They only know tuberculous lesions in cattle from text-books and museums.

Three years have passed since the official announcement of the final eradication of bovine tuberculosis in Denmark. However, tuberculin testing is still going on. Nobody dares stop, because we all know of human beings infected with the bovine type of tubercle bacteria, and we also have to take the possibility into account that here and there some few cows may be left that lack the ability to react to tuberculin.

All our cattle herds are tuberculin-tested in the course of a three-year period, and every year a number of reactors are found. They are slaughtered, because only herds registered as tuberculosis-free may supply milk to the dairies.

In spite of thorough examination, it is not possible to demonstrate tuberculous lesions in many of the reactors, but we have to be very critical when judging our tuberculin tests, and we do not want to run any risks. In our present position we would rather slaughter 10 animals too many than 10 too few. It does not surprise us that lesions caused by avian tubercle bacteria are found regularly, because the interest in combating the avian tuberculosis is very low.

While in 1940, on first examinations of human beings, 144 cases of bovine tuberculosis were diagnosed at the State Serum Institute, this figure had fallen to 43 in 1954. Moreover, no case of tuberculous meningitis was found during the last four years.

You may wonder why it is still possible, in 1954, on first examinations of human tuberculosis cases, to find 43 persons infected with bovine tubercle bacteria. The explanation will be found in the fact that these infections are diagnosed almost exclusively in older persons, while they were formerly most commonly found in younger ones. The persons whom we now find infected with the bovine type contracted the infection earlier in their lives, and that the activation of the tuberculosis has been brought about by an accidental lowering of their resistance, for example, during a protracted period of illness.

### Paratuberculosis

Thirty years ago Johne's disease of cattle played a rather big rôle in certain parts of Denmark. Since then it has been decreasing, and generally speaking is no longer of consequence. That does not mean to say that we do not encounter severe attacks in some individual herds, but they are few. During the last three years specimens from 70 suspected cases in cattle were sent to the State Veterinary Serum Laboratory for examination, but only in 32 cases was the diagnosis of Johne's disease established, so this disease is no real problem in our country.

### Rabies

Since 1950 rabies has spread extensively in Germany. Naturally enough, we, in Denmark, have been very anxious lest the disease should spread to our country, which has been free from rabies for nearly 70 years.

According to official reports 1,400 cases of rabies were diagnosed in West Germany in 1954, and 1,950 cases were diagnosed in the first 10 months of last year. The frequency of the disease would appear to be increasing. Out of the 1,950 cases diagnosed in the first 10 months of 1955, 1,166 (or 57 per cent.) were diagnosed in foxes and badgers. Next on the list were deer with 321 cases, cats with 169 cases, and cattle with 133 cases. Dogs are only fifth on the list with 123 cases, that is 6 per cent. of all cases diagnosed. In Denmark, various measures were taken, but not until the summer of 1953, when rabies was diagnosed in a marten found dead just south of the Danish-German frontier, was a vaccination campaign decided upon.

The vaccination was carried out in the autumn of 1953 and comprised all dogs within a 30 km. deep zone just north of the frontier. In the course of six weeks about 9,700 dogs were vaccinated with avianised vaccine and since then all dogs born in, or imported into, the area have been vaccinated.

Besides the vaccinations, we have, during the last two winters, introduced poisonous gases to the foxes' dens in a zone along the frontier, and we have put a premium on all foxes shot within the area.

Thus we have tried to guard against the danger from the south, and fortunately for us the position

has improved somewhat in South Schleswig and Holstein, so we may hope that the danger has passed for the present.

### Salmonellosis

In 1933 the import of meat-and-bone meal into Denmark was prohibited, but just after the last World War need for import of food-stuffs, rich in protein, was so intense that the Veterinary Directorate —though reluctantly—consented to dispensation from this prohibition. The dispensations were given on condition that the products were accompanied by certificates stating that they had been properly sterilised in the exporting country, and that, on arrival in Denmark, random samples of every lot were forwarded to the State Veterinary Serum Laboratory for bacteriological examination for pathogenic bacteria. If pathogens were demonstrated by this examination, the whole consignment had to be re-sterilised.

The outcome of these examinations was that erysipelas and *salmonella* bacteria were not infrequently found in the products. The presence of these organisms was taken as an indication of insufficient sterilisation or, rather, of contamination after the sterilisation had taken place. When these bacteria were present, other organisms of greater heat-resistance might also be present, for instance tubercle bacteria and anthrax spores.

Our position was most awkward. What kind of guarantee could be derived from the examination of random samples of a lot of several hundred tons? Perhaps, too, the lot was the product of several factories?

We had not to wait very long for the bad result to appear. In specimens from calves and adult cattle received by the State Veterinary Serum Laboratory for bacteriological examination, Joergen Müller found several of the types of *salmonella* bacteria which had been demonstrated in the imported meat-and-bone meal and *which had not previously been found in our country*.

In one big cattle herd 24 animals were found infected with seven different types of *salmonella* bacteria—some of them the same types as demonstrated in meat-and-bone meal. When these facts were brought to the knowledge of the agricultural organisations, they realised they were playing with fire and consented to a more rigorous policy: all imported meat-and-bone meal must be re-sterilised before release for sale.

We may possibly still find some of these *salmonella* types, hitherto unknown in our country, in our cattle herds. They have not, however, caused much damage. Widespread *salmonella* infections in animals, as in man, occur only under conditions especially favourable to the bacteria.

The *salmonella* type most commonly encountered by the bacteriological examinations of pathological material from dead calves, carried out at the State Veterinary Serum Laboratory, is *S. dublin*. However, infections with *S. typhi-murium* do occur.

The natural reservoir of *S. typhi-murium* (and many other salmonellas) is apparently poultry, and we have not yet been in a position to aim at, or to carry through, a complete eradication of poultry salmonellosis. In some cases we have seen that ducks' eggs have been responsible for cases of disease in man, and, consequently, we have prohibited the sale of eggs from ducks, geese, and turkeys, unless they are declared as such by a stamp on the shell. It is prohibited, too, to sell food prepared with such eggs, unless the final product has been heated to at least 80° C., and finally, it is prohibited to sell such eggs, if they have been incubated.

We are particularly uneasy about salads, the more so, if duck's eggs have been used for the dressing. Last summer we had, in Copenhagen, an epidemic of food-borne *S. typhi-murium* infection in man, and this could be traced back to a certain mayonnaise factory. However, it could not be established that duck's eggs had been used for the preparation of the mayonnaise.

The demonstration of *salmonella* and erysipelas bacteria in imported meat-and-bone meal caused us to consider whether the meal produced in our own factories was harmless.

An investigation was carried out, which resulted in the demonstration of pathogenic bacteria in the product of some Danish factories. The factories in question were—as are all our meat-and-bone meal factories—separated in two divisions, one for the raw materials and one for the final sterilised products. In spite of this, contamination of the final products, after they had left the autoclaves, was a possibility, for example through dust infection from the court-yard, or through the workers' footwear. In the room where the autoclaves are the temperature is relatively high, and the autoclaved products make an excellent medium for bacterial growth.

It goes without saying, that, after this discovery, we did everything practicable to correct conditions in these factories.

During the years before 1935 numerous poultry flocks in Denmark were constantly infected with *S. pullorum* and *S. gallinarum*. In 1934, on serological examination of 290,000 fowls, 6,000 reactors were found. In 1935, it was officially stipulated that hatcheries might only receive eggs from blood-tested flocks, and that hatcheries might not sell chickens when fowl-typhoid has been diagnosed on the premises. These measures resulted in a rapid fall in the number of infected flocks. All flocks that produce eggs for hatching are now blood-tested every second year, and consequently the number of outbreaks of fowl-typhoid are few. In 1954, only 30 reactors were found on serological examination of 850,000 blood-samples. All reacting birds are requested to be sent in for laboratory examination. In many of them neither lesions of fowl typhoid nor bacteria can be demonstrated.

### Swine fever

Swine fever was previously brought repeatedly into Denmark, but during the last 20 years we have been spared this disease, which always meant a great danger to our big bacon industry.

The explanation why it proved relatively easy to get rid of swine fever is to be found in the fact that the hot-bed of the disease was always the big waste-dumps near Copenhagen. The refuse-bins from all the houses in Copenhagen are carried out and emptied there daily. Besides ashes and waste material they contain a great deal of kitchen refuse and, therefore, pigs were kept. They were fed on what they themselves could pick up from the big heaps of refuse, which provided good food for them, and it was rather impressive to observe how many pigs could be fed by this means.

In the 20's it was prohibited to keep pigs on the waste-dumps, and since then we have had only one swine-fever enzootic, that of 1931-3. It began in a little fishing village on one of our southern islands, and there is hardly any doubt that the infection was brought by pigs smuggled into the country.

### *Vibrio fetus* Infection

About 75 per cent. of our cows are now artificially inseminated, and farmers take a keen interest in the question of an efficient control of sterility. *Vibrio fetus* infections have proved a frequent cause of sterility, and an examination of about 1,000 bulls in our 100 A.I. centres has been going on since 1954. The investigations are carried out in the Laboratory for Gynecology and Obstetrics at the Veterinary High School. Fifteen per cent. of the bulls in the centres examined until now have proved to be infected, and an infected bull can bring about a widespread infection.

*Vibrio fetus* infection in the bull is diagnosed by the technique described by H. C. Adler. A non-infected heifer is inseminated with a centrifuged deposit of semen and preputial wash fluid from the bull in question. Uterine biopsy for cultural examination is carried out six times within three weeks after insemination.

Infected bulls are treated by parenteral injection and topical application of dihydrostreptomycin. Though this treatment appears to be quite efficient, relapses are not uncommon.

The addition of streptomycin to the semen is widely used and contributes to the checking of further spread of infection. As the transmission of infection by other means (for example at markets and cattle shows) cannot be left out of consideration, and as the occurrence of resistant vibrio-strains is a possibility too, the final goal must be the complete eradication of vibriosis. The addition of streptomycin is, therefore, only to be looked upon as a first-aid measure.

### Mastitis

Mastitis control is also the object of keen interest. We, in the Veterinary Directorate, have hitherto confined ourselves to the stipulation, that if it should be desired to start mastitis control in a herd, the examination of milk samples should be carried out at a laboratory authorised by the Veterinary Directorate, and the control scheme should be in accordance with certain principles laid down by us.

I cannot boast of having taken a firm initiative in this matter. However, when we consider embarking on a programme of systematic mastitis control, it is imperative that we keep both feet on the ground. The occurrence of those streptococci that some years ago were incriminated as the main cause of mastitis, has decreased very much owing to treatment with antibiotics. In many cases, however, the only result is that they have been replaced by other bacteria. Many of these are commensals that cannot be removed from the environment in which the cows have to live. We are told to try to prevent the bacteria from gaining entrance to the teats and udders of the cows by suitable alterations of the environment and of the milking routine. It may all be quite correct, but we yet lack proof that it will be possible, by following these principles, to keep not only some selected herds, but all herds in an area, reasonably free from udder infections. Until such proof is available, I do not feel impelled to start a propaganda for embarking on a systematic mastitis control scheme.

From what I have said, and from the attached Table, you will realise that we, in Denmark, have very few serious diseases of domestic animals. This hardly depends on accident. We produce so many animals in our country, that the need to import animals from other countries is negligible. Apart from organs for the production of organo-therapeutic

(*Concluded at foot of col. 1, page 585*)

NOTIFIABLE DISEASES IN DENMARK
NUMBER OF INFECTED HERDS

| | 1946 | 1947 | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 |
|---|---|---|---|---|---|---|---|---|---|---|
| Horse scab | 4 | 5 | 12 | 7 | 1 | 0 | 1 | 1 | 1 | 1 |
| Pleuro-pneumonia of horses | 7 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Foot-and-mouth disease | 398 | 20 | 3 | 95 | 8 | 23,492 | 4,277 | 210 | 44 | 43 |
| Anthrax | 1 | 5 | 4 | 9 | 18 | 12 | 5 | 17 | 5 | 12 |
| Foot-rot of sheep | 6 | 8 | 0 | 0 | 1 | 0 | 1 | 31 | 13 | 6 |
| Brucella infection in swine | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 1 | 0 |
| Distemper in furred animals | 96 | 53 | 7 | 11 | 6 | 18 | 4 | 15 | 16 | 13 |
| Fowl pest | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |

| | | | |
|---|---|---|---|
| Epizootic lymphangitis | last outbreak | 1945 | Sheep pox | last outbreak | 1879 |
| Infectious equine anaemia | " | 1928 | Sheep scab | " | 1923 |
| Glanders | " | 1928 | Swine fever | " | 1933 |
| Dourine | has never existed in Denmark | | Rabies | " | 1889 |
| Contagious bovine pleuro-pneumonia | last outbreak | 1886 | Fowl cholera | " | 1926 |
| Cattle plague | " | 1782 | | | |

# The Principles of Veterinary Research and Administration in British Territories in the Tropics

BY

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IT is impossible for me to give a detailed account as the area is so vast, the conditions vary so greatly, and my experience is limited to Ceylon and, to a very small extent, India. I have no personal experience of Africa nor of the tropical parts of Australia. To generalise on such a subject is difficult and dangerous but I have felt it necessary to attempt some broad generalisations in an effort to pinpoint some of more important differences between the tropical countries and the highly developed countries such as Denmark and the U.S.A.* about which we have heard to-day.

Features which are common to many tropical areas and which influence the methods of dealing with infectious diseases of livestock include the following:—

(1) Road and rail communications are less well developed, as a result reporting of outbreaks and transport of staff and material to the scene of the outbreak are slower. In addition seasonal weather conditions such as monsoons often restrict operations.

(2) Fencing is often non-existent and so movement of live-stock is more difficult to control.

(3) In many areas there is a large population of wild game of various species many of which are susceptible to diseases of cattle and are capable of maintaining and spreading infection.

(4) Religious beliefs and local customs often influence to a very marked degree the measures which can be adopted without arousing violent reaction by the population.

(5) In some areas seasonal migration of stock in search of grazing and water is a very important feature which greatly influences both the spread of disease and the means which can be adopted for control.

(6) In some areas the very low commercial value of the native cattle poses economic problems.

(7) The use of cattle for draught purposes both for carting and ploughing is a very common practice in Asiatic countries. Very often the main economic value of the cattle to their owners is for ploughing, and an outbreak of disease at the season of the year when they are required for the cultivation of the paddy fields is a much more serious problem than if it occurred at any other time of the year. This applies very especially to the use of buffaloes for paddy cultivation in countries such as Ceylon, Siam, and Burma. Rice is the all important staple food crop and anything which interferes with the cultivation of the paddy fields at the proper time of the year is of the highest importance.

(8) In tropical countries, such as Kenya for example, where there is considerable European settlement the veterinary department is concerned with two very different cattle populations—the European owned and the African owned, with widely differing problems.

(9) In some areas overstocking with cattle of very small commercial value raises problems of soil erosion and sometimes poses the question whether any attempt should be made to reduce losses caused by disease.

(10) An overriding problem in many tropical countries is fodder supply. The idea of setting aside land for the cultivation of fodder crops for cattle is completely novel to many tropical cattle owners. Cattle are looked upon as animals which must find their own food by grazing. In many cases this means recurrent periods of semi-starvation in the dry season during which the cattle wander over great distances in search of food. Nomadic peoples go with their cattle, but in areas of settled agriculture the unfortunate cattle are a menace to cultivated crops and are driven out into jungle and waste lands. This is a very marked feature of the treatment which buffaloes receive in some rice-growing areas. They are urgently required during the short season when the paddy fields must be cultivated; at that time they are rounded up and often grossly overworked. When the work is finished they are turned out to fend for themselves. At this time they become wild and very difficult to catch and to handle for inspection and inoculation.

This list could easily be expanded, but these 10 points may serve to give some picture of the

* Permission could not be obtained for the publication of the American paper.

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**The Scientific and Administrative Principles underlying the State Control of Infectious Animal Diseases in Denmark.**—*Concluded.*

drugs, and hides, skins, and casings, very few animal products are imported. These latter are, however, imported in big quantities and often from countries where serious diseases of the domestic animals are prevalent. The danger incurred by such imports does not appear to be great, because the factories which import the products, and in which their further preparation takes place are mostly situated in Copenhagen, far from premises where domestic animals are kept. No untoward incidents have been reported.

contrast which exists between tropical areas and such places as Denmark and the U.S.A.

The title of our discussion speaks of the scientific and administrative principles underlying state control of animal diseases, and I should like to say a few words on the meaning of the word " scientific " in this connexion. To-day it tends to conjure up a picture of well-equipped laboratories with elaborate instruments, gleaming glassware, etc. But " science " really means knowledge, and sound knowledge can be gained outside the laboratory as well as in it. Indeed the basic knowledge of a disease and of its control has generally to start with observations in the field. This point tends to be forgotten in some quarters to-day, and I have sometimes felt that much time is wasted in laboratories where the workers are too much divorced from the field. In the early days of British development of tropical countries, before laboratories were available, much very valuable knowledge was gained by shrewd observation of the various diseases as they occurred in their natural environment and as they were influenced by factors of climate, density of stock, food supply, heredity, ectoparasites and movement of live-stock and so on, not forgetting discussions with the cattle owners to get from them their ideas.

That great veterinary scientist Sir Arnold Theiler often stressed the importance, when investigating a disease, of first getting the views and theories of the cattle owners, and following this up by personal observation in the field. It may be useful to bear in mind that veterinary services in the overseas tropical countries have a comparatively short history, and veterinary laboratories even shorter. The pattern of development has involved a preliminary period of what was really exploration or survey.

Exploration, or explorers, rather, is better applied to some of the remarkable men who initiated veterinary work in these parts of the world, and made notable contributions to geographical exploration as well as to knowledge of disease control. An outstanding example is Moorcroft who went to India in the old John Company days. His duty was to re-organise the horsebreeding activities of the company. He put the horsebreeding farms on a sound footing, and then set himself to travel widely in search of better breeds of horses adapted to the climate and to the needs of the John Company. His travels took him into Tibet in face of incredible difficulties, and his name still stands high in the records of Himalayan exploration. One of his journeys lasted seven years, and it is recorded that he carried with him £30,000 in jewels and gold to be used as presents to kings and princes through whose territories he had to pass. Among the many other things for which he is remembered is his introduction of the cultivation of oats to India. He was finally murdered on his way back from one of his journeys. His journals were later recovered and can be seen to-day in the library of the India Office in London.

Among many other great pioneers were such men as Stordy and Montgomery in East Africa, Hutcheon in South Africa, and Hornby in Tanganyika. These men paved a way and left a mass of knowledge in their reports which was used by their successors. Sir Arnold Theiler paid tribute to the value and accuracy of reports written by Hutcheon on a great variety of diseases in South Africa.

### The Veterinary Department

Following the pioneering stage came the development of veterinary departments. The problems which faced them were many, and naturally the more urgent were tackled first. In practically all the tropical areas in the early days rinderpest was the great killing disease which overshadowed all others, and the history of many veterinary departments is a history of the fight against this disease. The greater part of our present-day knowledge of rinderpest and of methods for its control comes from the British overseas territories. Development of methods of immunisation started in South Africa when rinderpest reached that country in the 1890's. Here Koch developed the bile method, and later he, with Kolle, Turner, and Theiler, produced immune and hyperimmune serum. Then Kolle and Turner introduced the serum-simultaneous method.

Chemically inactivated vaccines were developed by Boynton and Kelser in the Philippines, by workers in the French overseas territories, and by Daubney in Kenya, but they never became generally used in British territories.

The biggest step forward came from the work of Edwards at Mukteswar. He was influenced by the fact that the most successful vaccine against any virus disease was Jenner's smallpox vaccine. This, of course, consisted of a living virus which had been modified by passage in an unusual host. Edwards set himself to attempt to modify the rinderpest virus and used rabbits for this purpose. He succeeded, but when his stock of rabbits was wiped out by a virulent outbreak of pasteurellosis he used goats instead.

In its early passages in the goat the virus was still very virulent for cattle, but blood from infected goats was used as a source of virus in the serum-simultaneous method of immunisation. For this purpose it was better than cattle blood as it was free from protozoal parasites pathogenic for cattle. With continued passage in goats the virus became sufficiently attenuated to be used without serum. This of course greatly reduced the cost of immunisation. Since Edwards's work the rinderpest virus has been attenuated by passage in rabbits (Nakamura) and in chick-embryos (American and Canadian workers at Grosse Isle) but the goat-attenuated virus is still the most practical and the most widely used of all prophylactic agents against rinderpest. The success of this method has brought about a state of affairs where rinderpest is now under satisfactory control throughout Africa and in many parts of Asia, and veterinary departments now have more time to deal with other less-pressing problems.

Together with rinderpest in the early days there were other major problems which had to be tackled; for example trypanosomiasis, pleuro-pneumonia, and East Coast Fever in Africa, and haemorrhagic

septicaemia in Asia, to say nothing of piroplasmosis, anaplasmosis, blue tongue, and many other conditions.

The elucidation of these problems, in which Theiler in South Africa did such great work, left little time for any attempt to tackle the less spectacular plagues such as foot-and-mouth disease, tuberculosis, and brucellosis, about which I have been asked to speak.

### Foot-and-Mouth Disease

This is widespread in Asia and Africa but is not present in Australia and the West Indies or Fiji. It is fair to say that it is only within recent years that any attempt has been made in the tropical countries to come to grips with this disease. The reasons for the secondary importance of foot-and-mouth disease are briefly: it was overshadowed by other, more deadly diseases; foot-and-mouth is a disease which is much more severe in animals in good condition. In animals in poor condition the lesions are not severe and heal quickly. The native cattle of Asia and Africa are seldom in good condition; more often they are lean or emaciated. In my opinion the relative mildness of the disease in these cattle is the result of their poor condition rather than of any inherited or breed resistance. That being so, the disease is of minor importance in native cattle kept and managed under local conditions. However, in most parts of the tropics there are better cattle alongside the native cattle, especially dairy cattle, managed and fed under conditions approximating those which prevail in Europe and America. In such cattle, foot-and-mouth disease can be the cause of heavy financial losses.

The state of affairs, therefore, in many tropical countries, is that you have a large population of native cattle plus, in many places, large numbers of susceptible wild game which maintain the disease. The task of eradicating the disease from these is impossible under present conditions. That being so, the direction in which things will move, and are indeed already moving, is the use of vaccine to protect the valuable cattle—particularly the dairy cattle—against the constantly present threat of infection.

In Rhodesia, where cattle are a source of meat supply to the mining districts, outbreaks of foot-and-mouth are important as the movement of stock to market is hampered. In that country the method of dealing with an outbreak of the disease is to put a cordon round the area and then as rapidly as possible infect all the cattle within the area with virus from the initial outbreak. By this means the outbreak is quickly over and movement of stock out of the area can be resumed much sooner than if the disease had been allowed to run its course.

South Africa is unique among the tropical countries in using the slaughter policy to control foot-and-mouth disease.

A point of interest in the tropics is that quite simple methods of isolation often appear to be successful in limiting the spread of infection. The stringent precautions taken to prevent spread of infection in England, for example, are not practicable in many places, but much simpler precautions often seem to be successful. Possibly the reason lies in the sterilising power of the tropical sun.

### Tuberculosis

The disease is present in practically all parts of the tropics, certainly in all parts to which British and European breeds of cattle have been introduced. The incidence is generally low, and clinical cases are uncommon. The reason for the low incidence and severity of the disease is the subject of debate. Some consider that zebu cattle have an inherent resistance to the disease, others deny this and maintain that the answer lies in the fact that zebu cattle are seldom or never housed. Personally I favour that opinion. There are areas in the tropics where the incidence can be quite high, for example among the Ankola cattle of East Africa, and in milch buffaloes kept in large town dairies in some parts of India. In South Africa, too, the disease is quite common among dairy cattle.

It seems to me that with development of more modern methods of cattle husbandry, especially of dairying, tuberculosis could assume much greater importance in the tropics than it does at present. Now would be a favourable time to attack the disease with a view to its eradication, but in most countries little is being done because of shortage of veterinary staff, shortage of finance, and the pressure of more urgent problems.

### Brucellosis

Little precise knowledge is available about the extent of the disease in Asia and Africa. It has been diagnosed in many countries but serious outbreaks have seldom been reported. Most of the outbreaks which have come to light have been in dairy cattle. That may be simply because much more attention is paid to dairy cattle, or it may be that the conditions under which dairy cattle are kept favour the spread of the disease. Brucellosis is of increasing importance in South Africa, and in that country, and in Kenya, Strain 19 vaccine is being increasingly used.

### Administration

To attempt any detailed description of the administrative arrangements is quite beyond my ability; they vary so greatly with the different countries. Broadly speaking British rule in tropical countries is based on the principle of "indirect rule," which involves working through local chiefs and local organisations. British administrative officers have been very few in number, and British veterinary officers much fewer. In looking back on what has been achieved in the veterinary field, and bearing in mind that veterinary officers were so thin on the ground, one is amazed that so much has been done in so short a time. Administration in these countries depends on education. Not formal education in schools alone, but education by example and by discussion. Its success has depended on gaining the confidence of the people. To do that the first thing was to learn the language, then get to know the people and their customs. The next step was to recruit men as stock inspectors, veterinary guards, or police. At first these were young men chosen for hardiness, character, and knowledge of the local live-stock and people. As time went on youngsters with some schooling

became available who could be taught to take temperatures, keep records, examine blood smears, even make simple *post-mortem* examinations. Then veterinary schools were started in many places. At first the course of teaching was simple, lasting one or two years, but as time went on, full courses were given, and in India the veterinary schools were later attached to universities.

Together with the education of staff went the persuading of the cattle owners, through their chiefs, to accept modern methods of control. Here rinderpest was often a good friend. It was a disease known and feared and a successful immunisation campaign was often the beginning of trust and confidence in veterinary science. Once trust was gained, other developments were possible. District officers were appointed to plan and develop such things as inoculation campaigns, quarantine, regulation of grazing, marketing of livestock, and improved methods of marketing, preparing, and grading hides. All these activities were effected through the local chiefs, village committees, or whatever local governing bodies existed. Laboratories were developed at headquarters where, in addition to diagnosis and preparation of vaccines, research and the education of local staff could be carried out. Some of these, such as Onderstepoort in South Africa, Mukteswar in India, and Kabete in Kenya, are among the biggest and best-known veterinary laboratories in the world. Some idea of the scale on which they operate can be gained from the following figures taken from recent annual reports: Onderstepoort in 1954 issued 1,956,545 doses of blackquarter vaccine; 14,174,330 of blue tongue vaccine; 9,646,900 of anthrax vaccine; 7,589,333 of enterotoxaemia vaccine, and many hundreds of thousands of doses of other vaccines. A great proportion of these vaccines are injected by the cattle owners themselves.

Kabete in 1953 issued nearly 5,000,000 doses of rinderpest vaccines; 581,945 doses of blackquarter vaccine, 32,453 doses of blue tongue vaccine, 32,453 doses of Strain 19 vaccine, 69,868 of enterotoxaemia toxoid; 518,100 of pleuro-pneumonia avianised vaccine, and very many others. In 1954 in addition, they produced foot-and-mouth vaccine for the first time, the amount issued being 1,261,800 c.c.

Much more could be said if time permitted but one cannot close without brief mention of some of the highlights of veterinary endeavour in the tropics. Griffiths Evans, in India, was the first to show that trypanosomes could cause disease. This he did while studying surra in horses at Dera Ismail Khan. Watkins-Pitchford and his colleagues in South Africa did much to develop the dipping of cattle as a means of control of ticks and tick-borne diseases. L. Bevan, in Rhodesia, was the first to demonstrate that *Brucella abortus* could cause undulant fever in man. Edwards's work on the modification of the virulence of the rinderpest virus by passage in an unusual host gave the lead to the development of such things as lapinised swine fever vaccine, and the many egg-adapted virus vaccines such as the distemper vaccine and so on. Anderson, in Kenya, pioneered the use of artificial insemination in the British Commonwealth. This was done, before the technique was taken up in England, to control a venereal virus infection which caused sterility in cattle and which threatened to put a stop to the use of bulls of British breeds for grading-up stock in the highlands of Kenya.

# Experiments on the Transmission of a Septicaemic Disease of Ducklings

BY

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ASPLIN (1955), under the title " A Septicaemic Disease of Ducklings," described outbreaks of a disease on six farms. A gram-negative pleomorphic organism was isolated. This disease is believed to be identical with one which was described by Hendrickson & Hilbert (1932) on Long Island. These authors tentatively named the organism, isolated from affected ducklings *Pfeifferella anatipestifer*. The disease has been called " anatipestifer infection " or " new duck disease."

Graham *et al.* (1938) described, under the name duck septicaemia, a similar disease which occurred on a duck farm in Illinois. Recently Dougherty *et al.* (1955) have described the pathology of a similar condition and have suggested the name infectious serositis of ducks. This latter condition appears to be very common since it was diagnosed in 2,216 of the 7,155 ducks submitted to the Duck Disease Research Laboratory, Long Island.

It seems probable that all these reports relate to the same disease but final identification must await comparative study.

A condition of " green diarrhoea " in growing ducklings is well recognised by duck farmers in this country. This condition, normally, is brought to our attention only when it becomes a flock problem. However, it appears likely that it occurs in many flocks affecting only a few ducks at a time.

Although Hendrickson & Hilbert (1932) concluded that *Pfeifferella anatipestifer* was the cause of the disease, they were unable to reproduce the condition except by intravenous inoculation. Graham *et al.* (1938) were able to transmit the disease by intraperitoneal, intravenous, and intratracheal inoculation of tissue suspensions or cultures. Death occasionally followed conjunctival instillation. Dougherty *et al.* (1955) state that intratracheal and intraperitoneal inoculation of suspensions of liver, spleen, and serosal exudates were infective in 95 of 120 tests.

The writer has experienced no difficulty in transmitting the disease by parenteral inoculation of tissue suspensions or cultures.

In 1952-3 when the disease first came to our notice various experiments designed to determine the mode of spread were carried out. In three trials each involving 10 healthy ducklings placed in pen contact with sick and dying ducklings no transmission took place. Two trials gave successful results, in the first three out of five ducklings when exposed by inhalation to a mist

of dispersed culture sickened and in the second two of five dosed by mouth with culture sickened. The experimental ducklings used at that time were three- to six-week-old cross-bred table ducklings. No special note was made of the nature of the litter, the condition of the feet, or the presence of skin injury at the time of exposure. The fact that rather drastic means have had to be employed to set up disease with certainty with cultures of *Pfeifferella anatipestifer* have cast some doubts on the causal relationship of this organism.

The possibility that infection might enter through scratches, fissures, or punctures of the feet was suggested by the occasional presence of swelling and exudate in the tarsal and intertarsometatarsal joints and also by scratches or blotches on the webs of ducklings found to be infected with the disease. It is not known if such scratches were equally frequent in unaffected ducklings.

The vice of down or feather pulling may involve all the ducklings in certain pens. As a result their backs and wings may be denuded of down and feathers and the skin injured and bleeding. Such injuries could provide a portal of entry for *Pfeifferella anatipestifer*.

The question of the transmission of the disease was examined paying particular attention to the possibility of entry of the organism through scratches, punctures, and wounds of the skin of the body and feet.

## Materials and Methods

The experimental ducklings were four- to six-weeks-old Khaki Campbells, all of which had been employed in duck virus hepatitis experiments and had recovered. These ducklings had been brooded in wire-floored, battery brooders for two or three weeks and were then moved on a deep bed of straw. Before being placed on experiment the ducklings were examined individually for evidence of skin damage. With the exception of Experiment 4 in which the ducklings were bedded on different materials all the ducklings in each experiment were housed together.

The strain of organism used was one which had been isolated in 1952 from outbreak N (Asplin, 1955). This organism is referred to in this paper as *Pfeifferella anatipestifer*. Sheep-blood agar plates were heavily seeded, and after 48 hours' incubation the growth on each plate was washed off with 10 ml. of peptone broth. This suspension was applied in the manner indicated. Confirmation that death was caused by this organism was obtained by cultural and *post-mortem* examination.

In *Experiment 1* the wing web or the foot web were stabbed with a group of three mounted sewing machine needles which had previously been dipped in the culture suspension.

In *Experiment 2* the feet were swabbed with the culture suspension and then the foot webs of half the ducklings were stabbed with clean needles.

In *Experiment 3* the foot pad of half the ducklings was snicked with a scalpel and the ducklings then run on litter which had been used by an infected group.

*Experiment 4* consisted of three groups. One group was bedded on flint chips and two groups on washed builders' sand. The sand and flint chips were sprayed with the culture suspension. A small quantity of thistles, brambles, and holly leaves was placed on the sand in one of the houses in order to provoke the type of scratch or prick that might be expected to occur under natural conditions.

In *Experiment 5* the feathers and down over the elbow joint of half the ducklings were plucked and the skin lightly scarified in order to imitate the type of damage done by feather pulling. This area was swabbed with the culture suspension. A similar area over the elbows of the control ducks was swabbed with the same culture.

*Experiment 6* was carried out to confirm the impression which had been reached from earlier work that infection did not normally follow dosing by mouth, by intraocular or intranasal instillation, or by pen contact, but occurred readily when the skin was penetrated.

## Results

The results are presented in the table. It will be seen that infection followed in every instance where the foot web or wing web was stabbed either by infected needles or by clean needles through infected skin. Even though the ducklings were in pen contact infection took place in only one case (Experiment 2) where the skin was not intentionally damaged or exposed to damage. Examination of the feet of this duckling after death showed the presence of a number of superficial fissures in the skin of the pad and digits.

In Experiment 4, 6 of the 11 ducklings placed on infected sand in the presence of prickly plant material died, and in Experiment 5, all five of the ducklings plucked and scarified over the elbow joint died.

## Discussion

*Pfeifferella anatipestifer* infection is a disease of growing ducklings. It most frequently breaks out in one of the older groups, *i.e.* six to eight weeks, and tends to spread back until quite young ducklings may be infected. It may also occur in ducklings in second feather. In a small experiment we were unable to infect 12 one-year-old drakes.

The experiments described here provide circumstantial evidence that infection may normally enter through wounds, scratches, fissures, or punctures of the skin. The intact skin appears to provide an efficient barrier against infection.

The possibility that biting insects may play a part in the spread of this disease has not been explored. Our laboratory records are insufficient to disclose seasonal variations in incidence. Field reports suggest that the disease is more common in the winter months. If this is the case it would argue against insect transmission.

Not infrequently table ducklings are penned on stubble under-sown with clover. It is likely that the stubble, which might also contain thistles and other prickly weeds, would be capable of damaging the webs of the ducklings' feet. Stubble would be tougher during the autumn and early winter and would gradually weather and soften as time passed. Thus we might expect the disease to decline in the spring months.

TABLE I

| Experiment number | Bedding | Suspension | Methods of exposure | Number of ducklings | Mortality | Notes |
|---|---|---|---|---|---|---|
| 1 | Straw | 15th subculture | (*a*) Wing web stab | 7 | 7 | |
| | | | (*b*) Foot ,, ,, | 7 | 7 | |
| 2 | Straw | 10th subculture | (*a*) Foot web swabbed then stabbed | 9 | 9 | |
| | | | (*b*) Foot web swabbed not punctured | 9 | 1 | No symptoms in survivors |
| 3 | Straw (used by ducklings of Experiment 2) | — | (*a*) Foot pad snicked with scalpel | 6 | 3 | |
| | | | (*b*) Foot pad not snicked | 6 | 0 | No symptoms |
| 4. | (*a*) Flint chips | 2nd subculture | Bedding sprayed with suspension of culture | 11 | 0 | No symptoms |
| | (*b*) Washed sand | | | 11 | 0 | ,, |
| | (*c*) Washed sand with thistles, brambles, etc. | | | 11 | 6 | No symptoms in survivors |
| 5 | Washed sand | 2nd subculture | (*a*) Plucked over elbow joint and lightly scarified area Swabbed with culture | 5 | 5 | |
| | | | (*b*) Not plucked or scarified. Similar area swabbed with culture | 5 | 0 | No symptoms |
| 6 | Washed sand | 1st subculture | (*a*) Intranasal | 10 | 0 | No symptoms |
| | | | (*b*) Intraocular | 10 | 0 | ,, |
| | | | (*c*) By mouth | 10 | 0 | ,, |
| | | | (*d*) Pen contact | 10 | 0 | ,, |
| | | | (*e*) Foot web stab | 7 | 7 | |

The disease may occur whilst the ducklings are still in the brooders. When this happens the brooders should be inspected for sharp projections of wire, etc.

In Experiment 6 an attempt was made to imitate the injury caused by down and feather pulling. Down pulling may also commence when ducklings are still in the brooders. The vice usually spreads rapidly to involve all the ducklings in the pen. Extensive bleeding wounds may be seen.

Application of the culture to the damaged skin of the ducklings in our experiment resulted in infection taking place. Under field conditions it is unlikely that wing wounds would be contaminated as heavily as those of the feet particularly as sick ducklings are unlikely to indulge in the vice. However, it would be well to observe and correlate the incidence of anatipestifer infection with feather pulling.

The onset of symptoms can be checked effectively by dosing with sulphadimidine. It would be interesting to observe if the disease can also be controlled on infected premises by moving infected groups into paddocks or pens which are " kinder " to the birds' feet.

**Summary**

The results of a series of experiments indicate that infection with *Pfeifferella anatipestifer* normally takes place through wounds, scratches, or punctures of the skin, particularly that of the feet. The bearing that these results may have on the control and possible seasonal incidence are discussed.

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## A NEW HANDBOOK ON PIGS

Members of the Association will, by now, have received copies of the fifth section of the Report on Diseases of Farm Livestock. This section comprises a third edition, completely revised, on the husbandry and disease of pigs; and in view of the growing importance of this species in the national economy, the booklet should be of great value to veterinarians, especially those in private practice. It is noteworthy that the text includes a section on artificial insemination, some of the problems in connection with which have been described and discussed in these columns from time to time. The information here given, together with that contained in a Paper to be read at this year's Congress, makes available in an easily comprehended form the most up-to-date information on this subject; indeed, the entire booklet places a wealth of knowledge at the disposal of the busy practitioner.

# Canine Toxoplasmosis*

BY

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## Introduction

SINCE 1950, in Glasgow, a clinical and pathological study of canine distemper has been carried out. As this work developed it became apparent, gradually, that a proportion of dogs showing both clinical and pathological signs of virus activity were simultaneously affected by a protozoan parasite identified as *Toxoplasma gondii* (Campbell *et al.*, 1955). At the present time, in a collected series of 273 dogs, 18 examples of *Toxoplasma* infection (6.6 per cent.) were found. From one of the most recent of these the parasite was isolated, and has now been maintained for a period of six months by passage through mice Campbell, Mackay & Vantsis, unpublished work).

## Taxonomy and Morphology

While generally regarded as a protozoan, *Toxoplasma* is not yet fully classified. Lack of host specificity separates the organism from other protozoa, and morphological studies have proved inconclusive (Jacobs, 1953). Gustafson *et al.* (1954) declined to classify the parasite even after electron microscopic examination until a more detailed comparison could be made with other protozoa, using the same technique. Westphal (1954) suggested that *Toxoplasma* might belong to the *Trypanosomidae* in view of common tissue affinities, its antigenic relationship, and the apparent development of a flagellum-like structure when *in vitro*. Nevertheless, it would seem preferable to await further morphological and immunological studies before giving a definitive classification.

*Toxoplasma* is a crescentic or almond-shaped protozoan measuring approximately 6$\mu$ × 2.5$\mu$. Especially in films stained by Romanowsky methods, nuclear and cytoplasmic components can be distinguished. Strong claims have been made for the occurrence of flagella (Cross, 1947; Westphal, 1954) despite failure to demonstrate them by electron-microscopy (Gustafson *et al.*, 1954). The organism is an obligatory cell parasite and in tissue sections infected cells can usually be found; these are mainly réticulo-endothelial or muscle. Division by binary fission continues until the cell becomes crowded by a round or ovoid terminal colony (or " pseudocyst ") which may rupture to liberate the toxoplasms or persist as a resting stage (Cross, 1947). Large collections of unencysted parasites may develop in muscle fibres.

Although many species of animals have shown *Toxoplasma* infection, the organisms concerned appeared morphologically identical, and when isolated were capable of infecting a wide range of hosts, and showed a relationship by cross-immunity and serological methods. The only type species is, therefore, *Toxoplasma gondii*.

## Clinical Characteristics

It seems premature to describe clinical features for the canine disease in view of its apparent co-existence, in some cases at least, with distemper. This phenomenon has been alluded to by several authors (Campbell *et al.*, 1955; Seibold & Hoerlein, 1955; Yamamoto *et al.*, 1955). All the 18 cases studied in Glasgow have shown clinical and pathological features which support a diagnosis of concurrent virus infection, notably catarrhal signs, an interstitial, epithelialising bronchopneumonia, hyperkeratosis of the pads in some cases, and encephalitic lesions unrelated anatomically to changes directly associated with the toxoplasms. Cytoplasmic, acidophilic inclusion bodies have been constant in our series, often occurring in large numbers in a variety of tissues. It is striking, also, in this connection, that the parasite was present in very small numbers—and sometimes in a single organ—in 11 dogs which showed body-wide changes suggestive of distemper. In seven animals the toxoplasmosis was more or less generalised.

Several authors have described dysentery in toxoplasmosis and this feature might be expected in cases with gastro-intestinal ulceration. The severe necrotising effect of heavy liver infection would seem more likely to produce jaundice than distemper, in which that sign is rare. Marked respiratory distress is a feature of some cases which develop the multiple miliary lesions so prominent at autopsy, and severe depression has been mentioned by some workers. Otherwise little data can be offered at this stage which might assist the clinical worker, although more will be said later about serological and allergic methods of diagnosis.

## *Post-mortem* Findings

Lightly infected tissues may not show any changes to the naked eye. Differentiation of the grosser lesions of toxoplasmosis from those of distemper again poses a problem, but certain changes emerge from past work as having some degree of specificity. Progressive toxoplasmosis is a necrotising process, and when viscera such as lung, heart, and liver are involved, it is not uncommon to find multiple miliary foci. This is particularly so in the thoracic organs. Lymph nodes may be softened. Marked ulceration of the gastric or intestinal mucosae associated with toxoplasms has been described by previous workers (Mello, 1910; Olafson & Monlux, 1942; Sjolte, 1948; Langham & Scholl, 1949; Jasper, 1951; Moller, 1951), but this was not a feature of any of the present series.

* Paper delivered to a meeting of the Scottish Regional Group of the Association of Veterinary Teachers and Research Workers held on November 9th, 1955.

### Histopathology

Histological examination is certainly valuable and has often led to the unexpected finding of *Toxoplasma*. Because of the limited distribution of parasites in some cases it would seem necessary in any deliberate study of the disease to select several blocks from each of a wide range of tissues.

Occasionally a non-progressive infection is found when small groups of intracellular parasites or pseudocyst-forms occur in the absence of degenerative or inflammatory changes. Under this circumstance one might be tempted to adopt the dictum of Westphal & Bauer (1952) that " toxoplasmosis is not normally a disease." When active proliferation of the organism occurs, degeneration soon leads to a necrosis that is seen in its most extreme form in the macroscopic miliary lesions. Similar changes may occur in many other organs, including the brain. Lymph nodes may become totally necrotic. Cellular reactions are predominantly mononuclear, while in the brain gliosis may develop alongside perivascular infiltrates which sometimes include plasma cells. True granulomatous lesions have not been observed.

The histological demonstration of *Toxoplasma* is less satisfactory than a study of stained films. It is usually possible, however, without great difficulty, to identify organisms under high-power magnification ot haematoxylin-eosin sections. Pseudocysts are clearly recognisable through their limiting membranes. The large intracellular clusters seen in muscle are also outstanding.

### Diagnosis

At the present time, *post-mortem* diagnosis by autopsical or histological methods is much less difficult than clinical identification of toxoplasmosis. That appears especially so in the canine disease when distemper infection is often present.

Serological methods have been developed and applied to the study of human and canine toxoplasmosis. Most important among these are the complement-fixation test and the cytoplasm-modifying dye test of Sabin & Feldman (1948). It is not yet clear, from serological surveys, how great is the incidence of *Toxoplasma* infection in dog populations. Otten *et al.* (1951) claimed that 2.5 per cent of dogs in Hamburg were affected, and demonstrated antibody by means of the dye-test in 13 out of 26 dogs showing nervous distemper (Otten *et al.*, 1950). Cole and his co-workers (1953) in the United States found no antibody in the sera of 387 healthy dogs or in 125 dogs with diseases other than toxoplasmosis. They found, however, that 76 out of 1944 dogs reacted to the toxoplasmin allergic skin test. A further complication is the possibility that cross-reactions to *Sarcocystis*, *Trichomonas*, and *Trypanosoma* may occur (Mühlpfordt, 1951; Awad, 1954a and b).

In few cases has the organism actually been isolated. Mouse inoculation of organ suspensions from suspected cases is the recommended procedure. Toxoplasms may also be readily demonstrated in films stained by Romanowsky methods prepared from heavily infected organs.

### Public Health Significance

What, then, is the significance of toxoplasmosis to the veterinarian? In the dog, at least, the infection is not uncommon and can lead to severe and widespread lesions which may prove fatal. Increasing attention has been paid during recent years to human toxoplasmosis. The view is widely held that the disease, as reflected by the presence of cytoplasm-modifying antibody, is common and that subclinical infection may increase with advancing age (Sabin, 1941; Beverley *et al.*, 1954). It has been estimated that in Sheffield about 25 per cent. of the population become infected by the age of 20 (Beverley *et al.*, 1954). The same workers found a significantly higher reaction in the sera of veterinary surgeons, abattoir workers and, especially, of rabbit trappers.

In children progressive toxoplasmosis may take the form of congenital infection with symptoms referable to brain or ocular lesions. When the disease is acquired by older children, or by adults, a generalised systemic infection may develop. These forms of infection are, fortunately, uncommon. The mode of transmission of acquired toxoplasmosis is unknown, but since the dog may act as a reservoir of infection this potential source of *Toxoplasma* must be studied in greater detail. Suspected cases of canine origin have already been reported in man from the United States (Beckett & Flynn, 1953; Cole *et al.*, 1953) and from Germany (Hegewald, 1954). It remains to be seen, also, to what extent contact with other domestic animals offers the danger of infection.

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# In Brief

## COLD ENVIRONMENT AND YOUNG PIGS

CRUSHING by the sow is the most common cause of death during the first week of life (Reid, 1954). In this connexion it is of interest that Pomeroy (1953) has shown that an abnormal heat loss soon after birth may result in coma, with a consequent enhanced risk of crushing. A new-born pig is said to become comatose when exposed to a temperature of 35° to 40° F. for one hour. It was also found that the rectal temperature of a piglet falls four or five degrees within a few minutes of birth, and in undersized pigs, due to the relatively larger surface area, the temperature loss may be even greater. Provided, however, that the new-born piglet is able to obtain adequate nourishment it can maintain its body temperature within the normal range as early as 12 hours after birth. Thus the factors which may be involved in a high crushing rate include the temperature of the environment, the condition of the pigs at birth, and the milking qualities of the sow.

Cold environment has also been incriminated as a contributory cause of unthriftiness and deaths amongst pigs of three to eight weeks old. The condition, which is characterised by changes in the liver, could, it was found, be prevented by the provision of warmer housing (Howie, Biggar, Thomson & Cook, 1949; Naftalin & Howie, 1949). More recently, experiments have been carried out (Lucas & Thomson, 1953; Lucas, 1954) to determine if, in an otherwise cold environment, the syndrome could be prevented by well-insulated or warm floors, or merely by excluding dampness on solid concrete floors. It was found that, although the incidence of the disease was reduced by the better type of flooring, it was not eliminated, and even the control groups of pigs reared in the cold and damp environment failed to show marked unthriftiness. The true cause of this disease remains unknown. Attention is drawn to the similarity of the disease to toxic liver dystrophy occurring in Sweden and some other countries (Obel, 1953) which can be experimentally induced by feeding a diet deficient in sulphur containing amino acids and vitamin E. Mention is made by Lucas (1954) of the possible value of large-scale observations on this condition by veterinarians in the field.

C. S. GRUNSELL (May, 1955).

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# Current Literature

## REVIEW

**Farming Advisory Services in North America.** Report of a mission to Canada and the United States of America, June and July, 1955, sponsored by the Nuffield Foundation.

This is a report of a tour of Canada and the United States of America by a mission consisting of three farmers, a Principal of an Institution of Agriculture, and the Assistant Director of the Nuffield Foundation. The purpose of the mission was to judge the value and applicability of educational and advisory services as carried out under American conditions to the special circumstances of agriculture in Great Britain.

The first chapter gives a very comprehensive survey of the background of United States farming. The division of the States into dairying, stock raising, and stock feeding areas is discussed, together with the climatic and geographical reasons for this broad division of land. It is pointed out that North America is a much more rural country than Great Britain and that nett farm incomes are half those of the rest of the population. Because of the scattered distribution of the farming population, Agricultural Advisory Services, referred to in the United States as "Extension" Services, are as important from the social and educational as from the purely technical angles.

The second chapter deals with the provision made for teaching in agricultural colleges. The Acts providing for agricultural teaching and research, financed out of Federal resources, are set out and the amount of money appropriated for these purposes is stated. Figures are given showing the number of teachers and research workers engaged at colleges and research stations, and it is obvious both from these numbers and from the amount of money placed at their disposal, that the United States authorities spare no effort or expense in bringing agricultural training and research to the highest level of efficiency.

The third chapter deals with the recruitment, salary, and training of "Extension" staff. Some variation apparently exists between the terms of appointment of agricultural advisory staff in different counties, and it is noted that recruitment to the service is almost entirely by personal contact rather than by public advertisement. This method of recruiting staff will perhaps not commend itself to everyone as being entirely democratic in outlook. Regarding salaries, the report states that these vary from state to state and that the richer states are able to pay more attractive salaries and obtain the services of the better qualified men. On the other hand this variation in salary scale enables the more progressive officials to improve their position and gives an incentive which is perhaps lacking in our own nationalised Agricultural Advisory Service. While some states allow their agricultural advisers to farm as a side-line to their official duties it is rightly pointed out that it is exceedingly difficult for officials to give adequate attention both to their private pursuits and their official duties at one and the same time. The

training of men and women for professional agriculture is catered for at the land-grant college. The standard of basic education is commendably high.

The fourth chapter deals with the objectives, methods, and effectiveness of " Extension." The " Extension " Service is accepted voluntarily by the farming community; this service in the United States is based on the belief that a prosperous and contented agricultural population creates stability in the country and strengthens the nation as a whole. It is perhaps a little disappointing to see the statement made that " farming for the future is a noble idea but very few farmers are interested in it." Such an expression suggests that the Agricultural Advisory Service in the States seeks to teach the farmer how to exploit the fertility of his land rather than to build up that fertility for the benefit of his successors. As is to be expected in the modern world, planning occupies a prominent place in the " Extension " Service. Advisory officials make the minimum number of advisory visits to farms and these visits are chiefly for the purpose of planning programmes of cultivation, and of crop and stock rotation. The planning appears to extend even into the farmer's home, his private life, and that of his family. The press, radio, and television are made full use of in " selling " the agricultural advisory service, so that few farmers can be unaware of the assistance available to them. It is suggested that this service in the United States is better integrated than that in this country, and it is slyly hinted that the advice given by the several authorities offering agricultural advice in this country is sometimes conflicting and confusing to the agriculturalist. As in this country, so in the United States, it is found that the higher the social economic status of the farmer, the greater his use (but the less his need) of the advisory service. This is a point which is all too often overlooked, and help involving financial support from the Exchequer is frequently expended in the wrong direction. Not everyone will agree with the suggestion made by the mission that the part which " home economics " plays in America could meet with equal success in a country such as Great Britain.

Chapter five deals with the soil conservation service, farmers' home administration, and vocational-agriculture teaching. Agriculturalists in this country have much to learn from this chapter and there is no doubt that, compared with the Americans, we pay too little attention to soil conservation. In an industrial country such as Great Britain, however, the teaching of vocational-agriculture in high schools may not have the same justification as in the more extensive agricultural areas of the United States.

Chapter six deals briefly with the agricultural advisory service in Canada. It is pointed out that this service is more loosely knit administratively in Canada than in the United States, and is not so comprehensive or specialised in the variety of the services offered. The spread of agriculture northwards in Canada is likely to call for further educational advisory services, and as man-power is absorbed into new industries based on Canada's vast mineral deposits, agricultural labour is likely to become scarcer, and mechanism and specialised farming will create a greater demand for technical advisory services.

The final chapter of the report summarises the tour, the conclusions drawn, and the suggestions to be made from the experience gained by the mission. Briefly, this country has, as is recognised, something to learn from the experiences of other countries, and while retaining the best of our own organisation, we can knit into it some of the vigour of the younger countries of the new world.

The appendices deal with the curriculum at the Ohio State University of Agriculture, vocational-agriculture teaching in high schools, farmers' home administration, details of the itinerary of, and persons met by, the mission, and a selected bibliography.

This report will be read by agricultural advisers in the United Kingdom with much interest, and while it makes no direct reference to the veterinary aspect of agriculture, it will be found to be of great interest and value to those who recognise the veterinary profession as belonging to a great partnership of those who live and work on, for and by the land, embracing ultimately the whole of mankind who basically depend on the land for their existence.

H. B.

## ABSTRACTS

**The Practical Value of Artificial Insemination to the Poultry Industry from the Domestic Fowl Angle.** RAINFORD, A. J., (1956). *World's Poultry Science Journal.* **12.** 137-41.

The author states that artificial insemination is of great value in pedigree-poultry breeding by allowing more use to be made of outstanding cockerels. He also suggests that it should be used in progeny tests, so that one could compare the progeny produced by different strains of hens after insemination with pooled semen taken from a small group of cockerels.

Artificial insemination would be of much greater value if a satisfactory method of storing poultry semen could be found. Thus semen could be collected from outstanding sires during the out of season period and stored for future use.

**The Practical Value of Artificial Insemination to the Turkey Industry.** BRADBURY, J. (1956). *World's Poultry Science Journal.* **12.** 142-5.

The author considers that artificial insemination can already play an important part in the turkey industry as a supplement to natural mating. He believes that its use will increase but that it will never completely replace natural mating. He suggests that artificial insemination should be used to combat the infertility that is often prevalent early in the season and also to counteract the end of season fall in fertility. It is also useful for maintaining the fertility of hens removed from the breeding pens because of injury.

E. A. G.

# News and Comment

## CONGRESS HOTEL ACCOMMODATION

There is a small amount of accommodation still available in hotels where " block " bookings have been made on behalf of the Association. The time when these rooms can remain reserved has almost run out, and within a matter of days the hotels concerned must reclaim the rooms. Members who have not yet secured accommodation *are strongly advised to do so immediately*. Application for details should be made to Mr. J. H. McGhee, 46, Coten End, Warwick, who is hon. secretary to the Provisional Committee.

## GOLF TOURNAMENTS AT CONGRESS

Entries are invited for the golf tournaments which will be played during Congress week. There will be one for men and one for women, to take place at the Leamington County Golf Club on Thursday, September 20th. Members wishing to take part are asked to write as soon as possible to Mr. Rupert Knight, at 40, Queen's Road, Coventry.

## COMMONWEALTH FUND FELLOWSHIPS

The Commonwealth Fund of New York, which was inaugurated in 1925, having been endowed by members of the Harkness family, offers Fellowships for advanced study and travel in the United States. Those for 1957 include the following:—

*General.*—Twenty Fellowships are offered to degree graduates of a university in the United Kingdom of Great Britain and Northern Ireland. Candidates must be available in London for interview in March, 1957. Age: 23 to 32. Tenure: 12 to 21 months. Closing date of applications: December 15th, 1956.

*Home Civil Service.*—Five Fellowships are offered to permanent members in the higher ranks of the Civil Service in Great Britain, three for the administrative grades and two for the scientific and professional grades. Age: preferably under 40. Tenure: 9 to 15 months. Closing date of applications: December 10th, 1956, to the Treasury.

*Australian and New Zealand Civil Services.*—Five Fellowships are offered to civil servants in the Governments of Australia and New Zealand. Age: under 40. Tenure: 9 to 15 months. Closing date of applications: November 1st, 1956. Australian applications to Dr. H. Carlyle Forster, Box 4079, Melbourne; New Zealand applications to the Public Service Commission, Wellington. Awards made by the Fund through Nomination Committees in the Dominions.

*Oversea Civil Service.*—Two Fellowships are offered to Civil Servants in the Governments of British Colonies, Protectorates, and Trust Territories. Age: under 40. Tenure: 9 to 15 months. Closing date of applications: November 17th, 1956, to the Colonial Office, London.

The conditions for award of the General Fellowships are:—

A candidate is required to show a record of marked ability during his university career and of proficiency in some recognised branch of learning, art, or the professions. Experience in research and in post-graduate study constitutes a valuable (but not indispensable) qualification for appointment. Other things being equal, preference for awards will be given to applicants holding posts from which they can secure leave of absence, or to those who have definite plans for a career. It is hoped that among the applicants there will be some engaged in industry or in professional work who can secure leave of absence for a year of study in the United States in some scientific, technical, or other field of interest and value to them.

Candidates may be married or single, but should be over 23 and under 32 years of age on September 1st of the year of award.

No one is eligible who has already worked or studied in the United States for more than a few months.

Candidates are required to give an undertaking that, if elected, they will not accept another appointment which will interfere with their completion of the full period of the tenure of the Fellowship; and that at the end of their tenure in the United States, they will return to the United Kingdom, or to some other part of the British Commonwealth outside North America, and reside there for a period of not less than two years. The purpose of this stipulation is to ensure that Fellows shall not accept appointments in the United States immediately after the completion of their Fellowships. The Directors of the Fund attach great importance to this condition, and will allow it to be varied only in the most exceptional circumstances.

All selected candidates will be required to undergo medical examination, including chest X-ray, arranged by the U.S. Consular authorities. Expenses connected with the medical examination and interview in London by the Committee of award, including travel expenses within the United Kingdom, will be borne by the Fund. Recent vaccination against smallpox is demanded by the American authorities.

Further particulars may be obtained from the Warden, Harkness House, 35, Portman Square, London, W.1.

## ANIMAL HEALTH TRUST AWARD

The authorities of Bristol University have nominated Mr. D. F. Kelly of Chelmsford, Essex, for an Evans Final-Year Studentship at that university.

## FOOT-AND-MOUTH DISEASE

*Amendment of Foot-and-Mouth Disease Infected Area around Sutton-in-Ashfield, Notts.*

The area described below is substituted for that previously Scheduled.

IN THE COUNTY OF DERBY: the petty sessional Division of Belper; the parishes of Alderwasley and Crich.

*Petty Sessional Division of Alfreton:* the parishes of South Wingfield, Wessington, Brackenfield, Ashover, Stretton, Clay Cross, Pilsley, Morton, Shirland and Higham, Tibshelf, Blackwell, South Normanton, and Pinxton.

*Petty Sessional Division of Chesterfield:* the parishes of Wingerworth, Hasland, Calow, Tupton, North Wingfield, Temple Normanton, Sutton-cum-Duckmanton, Heath, Ault Hucknall, Glapwell, Bolsover, Scarcliffe, Pleasley, and Shirebrook.

*Petty Sessional Division of Matlock:* the parishes of Tansley and Dethick Lea and Holloway.

IN THE COUNTY OF NOTTINGHAM: the city and county borough of Nottingham; the borough of Mansfield.

*Petty Sessional Division of Nottingham:* the parishes of Newstead, Linby, Papplewick, Hucknall Torkard, Bestwood Park, Calverton, Arnold, and Shire Hall.

*Petty Sessional Division of Southwell:* so much of the parish of Rufford as lies within the petty sessional division and to the west of the main road (A.614) running from Ollerton to Nottingham excluding the said road.

*Petty Sessional Division of Worksop:* the parish of Nether Langwith.

*Petty Sessional Division of Mansfield:* the parishes of Warsop, Clipstone, Mansfield Woodhouse, Sutton-in-Ashfield, Kirkby-in-Ashfield, Lindhurst, Blidworth and Haywood Oaks, and so much of the parish of Rufford as lies within the petty sessional division.

*Extension of the Foot-and-Mouth Disease Infected Area around Swarkestone, Derbyshire*

An area comprising:—

IN THE COUNTY OF DERBY: the petty sessional division of Ashbourne; the parish of Hulland Ward.

*Petty Sessional Division of Belper:* the parishes of Shottle and Postern, Turnditch and Ashleyhay.

*Petty Sessional Division of Wirksworth:* the parishes of Callow, Kirk Ireton, Idridgehay and Alton, and Biggin, and so much of the parish of Wirksworth as lies to the south and east of the road (B.5035) running from Carsington via Wirksworth to Crich including the said road.

*Extension of the Foot-and-Mouth Disease Infected Area around Nantglyn, Denbighshire*

An area comprising:—

IN THE COUNTY OF DENBIGH: the petty sessional division of Ruthin; the parishes of Llanferres and Llanarmon.

IN THE COUNTY OF FLINT: the petty sessional division of Mold; the parishes of Cilcain, Mold Urban, and Nercwys, and so much of the parish of Mold Rural as lies to the south and west of the main road (A.541) running from Tardd-y-dwr to Mold and to the west of the road running from Mold via Bromfield Hall and Pistyll to Tryddyn including the said roads.

*Petty Sessional Division of Northop:* the parish of Halkyn.

## CHANGES OF ADDRESS

When members of the Association change their addresses it would help our dispatch department very much if the changes could be made known promptly and in full. At the same time perhaps members would be good enough to give their *full* Christian names, as in some cases initials are the same as those of others sharing the same surname. Only last week, for example, 54 copies of THE RECORD were returned marked "gone away," having been posted to readers who had removed without notifying the Association of their new addresses.

## PERSONAL

**Births**

HAYES.—On August 15th, 1956, to Catherine, wife of Hilton Hayes, M.R.C.V.S., of Nestors, Starkholmes Road, Matlock, Derby, a son, Geoffrey.

MURCHIE.—On August 22nd, 1956, to Cathie, wife of Kenneth Murchie, B.SC., M.R.C.V.S., 6, English Street, Longtown, a son.

PHILLIPS.—On August 19th, 1956, at the Princess Elizabeth Hospital for Women, Nairobi, to Myra, wife of George D. Phillips, B.SC., B.V.SC., M.R.C.V.S., of the East African Veterinary Research Organisation, Muguga, Kikuyu, Kenya, a son.

STOCKMAN.—On August 20th, 1956, to Valerie, wife of Michael Stockman, M.R.C.V.S., of 114, Hillside Gardens, Barnet, Herts, a daughter—Caroline Rosemary.

## COMING EVENTS

**September**

7th (Fri.). Meeting of the South Wales Division, B.V.A., in the Embassy Rooms, Swansea, 2.15 p.m.

12th (Wed.). Meeting of the North Wales Division, B.V.A., at Leahurst Veterinary Field Station, 11.30 a.m.

**16th to 22nd (Sun. to Sat.). 74th B.V.A. Annual Congress at Royal Leamington Spa.**

19th (Wed.). Meeting of the Veterinary Christian Fellowship at Arlington House, 3, Arlington Avenue, Leamington Spa, 4.30 p.m.

27th (Thurs.). Meeting of the Lakeland Division, B.V.A., at the George Hotel, Penrith, 6 p.m.

**October**

6th (Sat.). Joint Meeting of the Nutrition Society and The Laboratory Animals' Bureau at Guy's Hospital Medical School, St. Thomas Street, London, S.E.1, 10.40 a.m.

12th (Fri.). Meeting of the Welsh Branch, B.V.A., at Aberystwyth.

16th (Tues.). Joint Meeting of the Essex Division, B.V.A., with the Essex Branch of the N.F.U. at the Essex Institute of Agriculture, Writtle, Nr. Chelmsford, Essex, 7.30 p.m.

**November**

22nd and 23rd (Thurs. and Fri.). B.V.A. Conference on Supplements and Additives in Animal Feedingstuffs at the Victoria Halls, Bloomsbury Square, London, W.C.1.

## ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

### Anthrax

*Denbighs.* Tan-y-bryn, Llanefydd (Aug. 22).

*Derby.* Moat Hall Farm, Hartington, Buxton (Aug. 20); Eastfields Farm, Netherseal, Burton-on-Trent (Aug. 22).

*Staffs.* Lawn Farm, Winkhill, Leek (Aug. 20).

*Wilts.* Villee Farm, Nettleton, Chippenham (Aug. 23).

### Foot-and-Mouth Disease

*Denbighs.* Dolycaeau, Llangynhafal (Aug. 24).

*Derby.* Chestnut Farm, Buxton Road, Repton (Aug. 21); County Council Smallholding, Burton Road, Repton; Lodge Farm, Far Laund, Belper; Woodlands, Chellaston (Aug. 26).

*Glamorgan.* Cycle Street, Cardiff (Aug. 20).

*Glouc.* Tanhouse Farm and Arams Farm, Newnham-on-Severn (Aug. 24); North Common Farm, Warmley, Bristol (Aug. 26); Bradley Court Farm, Mitcheldean (Aug. 27).

*Monmouth.* Pen Terry Farm, St. Arvans, Chepstow (Aug. 20).

*Nottingham.* Cuttings Farm, Fulwood, Sutton-in-Ashfield (Aug. 21).

### Fowl Pest

*Berks.* Oakwood, Waterloo Road, Wokingham (Aug. 20).

*Lancs.* Ridley House, Ridley Lane, Croston; 51, Moor Road, Croston; Moss Farm, Moss Lane, Bretherton, Preston (Aug. 22); 91, Blackpool Road, Carleton, Blackpool (Aug. 25).

*Lincs.* 150a, Woodville Road, Boston (Aug. 21); Main Road, Leverton, Boston (Aug. 23).

*Norfolk.* Winterton Allotments, Winterton, Gt. Yarmouth (Aug. 20); Hollands Hall, Yaxham, Dereham (Aug. 23).

### Swine Fever

*Essex.* Rumbolds Farm, Boreham Road, Sandon, Chelmsford (Aug. 23).

*Lancs* Bullsnape Hall Farm, Goosnargh, Preston (Aug. 22).

*Leics.* Grange Farm, South Croxton (Aug. 23).

*Salop.* The Limes, Vauxhall, Newport (Aug. 27).

*Somerset.* Firepool Piggeries, Canal Road, Taunton; Oak Hill Farm, Lillesdon, Wrantage, Taunton; Hillside, Ham, Combe St. Nicholas, Chard (Aug. 23); Cimber Lane Piggeries, Chard (Aug. 27).

*Staffs.* 344, Prestwood Road, Wolverhampton (Aug. 24).

*Surrey.* 24, Yew Tree Way, Addington, Croydon (Aug. 24).

*Warwicks.* 39, Oak Tree Lane, Selly Oak, Birmingham (Aug. 20).

## CORRESPONDENCE

*The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.*

### Medical Diagnostic Aids and the Veterinarian

Sir,—I would like to support the plea made by Dr. F. R. Bell in his paper on " Medical Diagnostic Aids and the Veterinarian " reported in your issue of August 4th, for an extension to animals of the application of diagnostic methods used in human medicine.

It is true that, before new applications can be made, much basic research is needed; but, at least in the field of clinical biochemistry, a great deal of information is already available, and it is only the developmental work—the *adaption* which must come before the *application*—that remains to be done. Dr. Bell mentions as a typical biochemical diagnostic technique the measurement of the functional activity of the kidneys, placing great stress on the difficulties involved in using such methods in animals. During the past five years, Emil Poulsen of this Department has carried out, without elaborate equipment, most of the fundamental research needed on the renal clearance in the cow of endogenous creatinine, inulin, urea, and other substances of physiological and pharmacological importance and has paved the way for the development of suitable clinical methods. His work should be published in English during the course of the next six months. The difficulties mentioned by Dr. Bell are by no means insuperable. It is surely possible that, in the majority of veterinary cases, the "shot-gun" type of kidney function test used in human medicine may prove unnecessary. Simpler methods, such as measurement of " water excretory threshold " and the " index E " of Barclay, Kenney, and Cooke, may be found to suffice, and these require only a single urine and blood sample. The emphasis in adapting methods to clinical use should always be placed on simplicity.

One of the major difficulties standing in the way of the progress of clinical biochemistry is the association of the expression, by many clinicians, with routine determinations of calcium, magnesium, phosphorus, sugar, and ketone bodies, these being thought to be all that can usefully be provided by the biochemist. It is regrettable that, because of this, a young man entering the field of veterinary clinical biochemistry is likely to have his activities directed from developmental work to the provision of the results (quite often meaningless) demanded by the clinical departments. This is a fault common to veterinary schools in both Britain and Scandinavia. It may be that the first task will be to provide refresher courses for some of the clinicians in our teaching establishments!

Yours faithfully,

R. J. GARNER.

Department of Pharmacology and Toxicology,
Royal Veterinary and Agricultural College,
Copenhagen.

*August 16th*, 1956.

### Telephone Charges

Sir,—If a veterinary surgeon leaves his own premises, for three or four hours, say, to spend them with a friend only 10 miles away, and if he asks the local telephone exchange to put any call that might come for him through to his friend's house, the Post Office will charge him five shillings. This is so even if no call is received, and therefore no service is rendered. The telephone manager has confirmed this. I fear that many members, like myself, were not aware of this charge.

Yours faithfully,
W. E. BLACKWELL.

Wood Burcote,
Towcester.

*August 11th*, 1956.

### Tonsillectomy in the Dog

Sir,—I enjoyed Mr. R. A. Roper's paper on tonsillectomy, very likely because he echoed much of my experience and thinking. The principal differences lie in techniques of anaesthesia and surgery. We have found that administration of methyl atropine about one hour prior to surgery produces an almost dry field in which to work.

Mr. Roper uses epinephrine on swabs to control bleeding; we inject it into and around the pillars and the capsule, using 1 to 2 ml. of 1:1,000 solution for each tonsil. In addition to excellent hemostasis, this raises the tonsil out of its crypt, so that it can be more easily visualised and manipulated. The tonsil is held with Allis forceps, and the pillars are cut with scissors, following which the capsule is cut as close as possible to the tonsil to avoid the large artery, lying deeper. In most cases, the cutting is done through epinephrine-filled connective tissue, which helps protect the lymphoid tonsillar tissue itself from being severed. In the few cases where further hemostasis is required, this is readily accomplished by pressing dry, absorbent cotton into the empty crypt.

Yours faithfully,
AARON APPLEBY.

Scarsdale Animal Hospital,
741, White Plains Post Road,
Scarsdale,
N.Y., U.S.A.

*August 15th*, 1956.

### Suspected Zinc Poisoning

Sir,—We have two cases of suspected zinc poisoning in young cattle, but have not any records of the symptoms. We wonder if any colleagues have *post-mortem* findings from comparable cases with more conclusive proof of poisoning.

Such symptoms as were described to us included rapid emaciation, scouring of black faeces probably due to broken-down blood, and death within four days.

*Post-mortem* findings were not very helpful. In each case there was general emaciation with sunken eyes. The lungs were normal, heart flabby in diastole and with dark clots in both ventricles. The rumen was half full and its contents were normal in consistency but there was extensive exfoliation of the mucosum. Omasum was empty and soft; abomasal contents were yellowish, slimy, and fluid. The small intestine was empty, mucosum being pale in colour and coated with slime. The caecum and colon contained a little blood-streaked yellowish slime. The rectum contained the same without the blood and this material exuded from the anus. The liver was pale and more friable than usual, kidneys of normal appearance.

The source of zinc was the impregnated fabric used in covering electric cables. Eighty parts per million have been recovered from the stomach contents.

Yours faithfully,
MICHAEL HUTCHISON.

Belgrave,
34, Gawber Road,
Barnsley.

*August 13th*, 1956.

ADVERTISER'S ANNOUNCEMENT

ALLEN AND HANBURYS LIMITED announce the introduction of Dequadin Wound Powder. This is an effective prophylactic and therapeutic topical dressing for veterinary use in both clean and contaminated wounds. It is a free-flowing powder containing in a specially compounded urea base 0·1 per cent. Dequadin, decamethylene-bis-(4-aminoquinaldinium chloride), the potent new antimicrobial substance developed by their Research Division. Dequadin is active against both gram-positive and gram-negative organisms, is non-toxic, and is not antagonised in the presence of serum or pus.

Dequadin Wound Powder is issued in packs for dispensing, and is available in cartons containing one dozen 15 g. screw-capped tubes and in 200 g. aluminium containers.

**DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN**

**Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases**

| Period | | Anthrax | Atrophic Rhinitis | Foot-and-Mouth | Fowl Pest | Sheep Scab | Swine Fever |
|---|---|---|---|---|---|---|---|
| 16th to 31st July, 1956 | | 26 | — | — | 34 | — | 50 |
| Corresponding period in | 1955 | 11 | 1 | — | 27 | — | 60 |
| | 1954 | 11 | — | — | 17 | — | 80 |
| | 1953 | 13 | — | — | 42 | — | 127 |
| 1st January to 31st July, 1956 | | 1,063 | 8 | 13 | 388 | — | 471 |
| Corresponding period in | 1955 | 472 | 2 | 6 | 371 | — | 964 |
| | 1954 | 171 | 3 | 12 | 567 | — | 969 |
| | 1953 | 458 | — | 26 | 661 | — | 1,953 |